

19. *Notes on the Early Stages of Phasis felthami Trim., a Lycaenid Butterfly from the Cape Peninsula, and a List of some recently determined Food-plants of some other South African Butterflies.*
—By C. G. C. DICKSON.

(With Plates XVIII, XIX.)

THE genus *Phasis* constitutes one of the largest groups of the South African Lycaenidae, being represented in the Union by about thirty known species, a number of which are peculiar to the country. Despite the fact that many of these insects are abundant (though generally local), particularly in the Western Districts of the Cape Province, the life-histories of the great majority of them are still unknown.

The species whose early stages are outlined in these notes was described by Trimen in the Transactions of the Entomological Society of London, 1904, p. 233, and recently redescribed and figured by the Rev. Desmond P. Murray in "South African Butterflies: A Monograph of the Family Lycaenidae," p. 108, and coloured illustration, No. 55.

I am very much indebted to my friend, Mr. Gowan C. Clark, of Port Elizabeth, to whom I forwarded examples of the egg and larva of the insect in March 1937, for the loan of a set of beautifully executed enlarged paintings, some of which are reproduced in half-tone on Plate XIX, and for furnishing me with an interesting description of the action and function of the retractile tubercles of the larva.

Near Milnerton on 20th April 1936 a female of *Phasis felthami* was kept under observation for the purpose of procuring eggs of the species and ascertaining the food-plant. The butterfly was followed for some time until it eventually selected a suitable spot for ovipositing, this proving to be a collection of dead leaves and other debris, which had accumulated under a low succulent-leaved shrub (*Zygophyllum sessilifolium* L., Plate XVIII), which grows commonly in the sandy ground bordering the coast-line. The insect alighted under the bush and immediately commenced ovipositing, crawling about for short distances and laying eggs singly at fairly frequent intervals on the withered leaves, small twigs, and among particles of loose sand.

Eight or more eggs were laid before it moved off again into open ground. The eggs were deposited at about 3.30 p.m.

The *egg* (Plate XIX) is about .8 mm. in diameter, subglobular in shape, flattened at the base, and creamy-white in colour. The crown is somewhat compressed and the micropyle sunken. The surface is sculptured with a fine network of ridges, the interstices being extremely small round the centre of egg and attaining a maximum size on the sides.

The egg-stage lasted 20 days—cold weather prevailing during this period—and a single larva hatched out on 10th May. Prior to emergence a portion of the crown of the egg is eaten away, and before long a few hairs of the larva appear through the opening thus formed.

The *larva on emergence* (Plate XIX) is about 1 mm. in length, proportionately broad and considerably flattened. Ground colour dull yellow. Upperside sparsely speckled with black and marked longitudinally with broken reddish streaks. Head of moderate size; black. A broad area on first segment and a disc on anal segment hardened; dark brown or blackish. Surrounding body is a ridge, set with prominent, mostly curved, bristles. On the 10th segment dorsally is a pair of long branched spines, normally prostrate but at times directed upwards. Setae, forming a double row on dorsal surface, appressed. Pair of retractile tubercles on 11th segment.

The larva feeds on the leaves of the food-plant, devouring the fleshy interior substance and the overlying cuticle. Feeding occurs between long intervals of rest, when the larva remains motionless in some chosen resting place. The rate of growth in captivity was remarkably slow, though this may have been caused by the change to winter conditions usual in the month of May. Unfortunately the single larva obtained was lost, due to falling off a sprig of the food-plant, a month after emergence. It was then still in the first instar.

Mr. Clark succeeded in rearing a larva from the egg to the end of the third instar and has supplied me with the following record, which may perhaps be taken as typical of the normal rate of development of the larvae:—

Duration of first	instar	.	10 days,
„	„ second	„	. 12 „
„	„ third	„	. 12 „ (larva died while moulting).

After the first moult the form of the larva closely approximates to that ultimately assumed. The pair of branched spines are lost, the

lateral bristles are increased in number, most of the more prominent longitudinal lines (which are dull light-red at this stage) and some other principal markings of the mature larva are recognisably distinct, and, as Mr. Clark has pointed out to me, the honey gland now appears on the 10th segment. The ground-colour of the larva is white at this period, but in time changes to a stone-coloured tint.

On 6th June a small colony of 15 larvae, ranging in size from 5 mm. to 13 mm., was found in the original locality at the base of one of the food-plants. The larvae were associated with ants (a species of *Cremastogaster*) and were afforded cover and concealment among a mass of debris consisting of withered leaf and other vegetable fragments mixed with numerous grains of sand, small pebbles and a few small snails' shells. This accumulation was loosely bound together with silken web, being partially attached to the bottom of the stem, and at one point extending below the surface of the ground. A few larvae were found below ground-level in a little cavity at the side of the stem, and two others were seen some distance up the stem within reach of the leaves. It was obvious that the larvae were engaging the attention of the ants, the source of attraction being the honey-gland, a characteristic feature of many of the larvae of the *Lycaenidae*. The actual act of "milking" on the part of the ants was not observed on this particular occasion, though the retractile tubercles in close proximity to the gland came into action whenever the larvae were disturbed. Similar ants were previously seen under the *Zygophyllum* bush when the butterfly was ovipositing.

The larvae were collected and later placed on a young food-plant growing in a pot, a light framework of sticks being secured over the top and covered with mosquito netting. A portion of the original "nest" was attached to the bottom of the stem.

In captivity the larvae existed independently of ants and the majority ultimately pupated, but their development was very slow, and it was not until 2nd August that pupation of the largest specimen took place. The larvae were very sluggish in their movements, and when not engaged in feeding continued to assemble together on the side of the stem and among the debris. When the larva is inactive the head is retracted into the first segment. At a later date further larvae in smaller groups, and at times occurring singly, were discovered below the food-plants, and occasionally in fissures that had formed between the stems. *Zygophyllum flexuosum* E. & Z. (Plate XVIII) and *Z. morgsana* L. were found to be additional plants used by the species.

The full grown larva (Plate XVIII, larva about 80 per cent. full grown; Plate XIX, lateral view of 7th segment) measures 16–17 mm., is broad, and ventrally flattened. Dorsum slightly arched; ridge surrounding body crenate on sides and upswept on first segment, curving round in front of well chitinised dorsal portion; last segment much flattened and sloping to anal extremity, with a circular dorsal area chitinised like upper surface of first segment. Numerous small stud-shaped spines (Plate XIX), perceptible as such only under a strong lens, are distributed over upper surface of body and over ridge (these contributing towards producing pattern of upperside); spines variously coloured: black, white, or more or less of the ground-colour of body. Bristles on sides of body and round extremities brownish grey, the majority darkening appreciably towards base, of various lengths and considerably more numerous and relatively shorter than on newly emerged larva.

Ground colour of body above, stone-coloured; often tinged in parts, especially on dorsal surface, with salmon-pinkish. Ventral surface (including prolegs) pale green to greenish-grey, tinged extensively with pale vinous. Head black, tinged on clypeus with dull reddish; division between lobes whitish; basal section of antennae red. Greater portion of dorsal area of first segment blackish. Longitudinal lines reddish brown to blackish; all except a barely separated very dark medio-dorsal pair, decidedly sinuous or irregular. Narrow space between sub-dorsal line and a series of very dark markings, creamish; line above spiracles, separated from the latter series by a broad strip, darker (often considerably darker) than general background; the lowest line of upperside between spiracles and margin of lateral ridge. Large areas of last three segments, particularly 11th and terminal ones, blackish. Underside of body bordered below ridge with deep maroon. Thoracic legs brown, for most part very dark; fleshy portions of the ground colour of ventral surface.

In regard to the honey-gland (situated between a greenish false gland and a dull red bulge) and retractile tubercles (Plate XIX), Mr. Clark in a letter to me states:—

“The tubercles of the *Lycaenidae*, at one time an unexplained organ, can now I think be described as a sentinel of the honey gland.

“In the case of *Myrina ficedula* Trim. it is merely a small warning projection. In the smaller species of the genus *Cupido* it is more developed and is a larger projection crowned with barbed and pointed spines, the larvae of *telicanus* Lang. sometimes using the partially extended tubercle as a brush. The larvae of *Phasis osbecki* Aur. and

felthami Trim. definitely use the tubercle as a brush or whip and sweep the vicinity of the honey-gland with quick, determined lashes.

"Dealing with *Phasis felthami*, the tubercle is present in the newly hatched larva and can be made to function by touching the larva with a hair of a paint brush. This organ is level with the body and difficult to detect until it functions. The honey-gland is not apparent in the first stage.

"After the first moult the tubercle is encased in a prominent black cylindrical mole and is shot out on being disturbed and remains stationary for some seconds. It resembles a white club with seven spines, three on each side and one on top, the seven being in one row.

"After the second moult the cylindrical mole containing the tubercle develops a semicircle of spokes round the rim and these act as a protection to the protruding hairs; the remaining portion of the circle is open to allow the tubercle to function.

"The tubercle from this stage on consists of a piston fitted with three hairs on top and two more on each side near the top, working in and out of the cylindrical case.

"As the piston is protruded the three top hairs strike out and with the bending of the piston strike the vicinity of the honey-gland. The two hairs on either side shoot out with the rest but as the piston is extended their position on the side makes them sweep through an arc, the one to the side, the other to the rear on each side. In this way a large field is dusted.

"The beats are very rapid, vibrating at the rate of some two or three strokes per second, and are preceded by fretful tremblings of the unextended tubercle.

"Any small insects attempting to approach the honey-gland meet with a whirl of beating hairs and retreat. In this way the honey is reserved for the larva's protectors."

In captivity pupation was in most instances effected on the surface of the pile of debris, at the base of the food-plant.

The *pupa* (Plate XVIII) is 9-10 mm. in length, being relatively full in diameter; colour very dark brown. Front of head rounded; thorax distinctly convex dorsally; wing bases protuberant; abdomen wide to about middle, then tapering, curving downwards to extremity and terminating obtusely. Cremastral hooks small, golden-brown, disposed beneath, and over end of terminal segment. Pair of small protuberant patches above eyes and first one or two small protuberant spiracular patches, pale buff; remaining spiracular patches terra-cotta. Last few segments narrowly marked at edges (principally

in dorsal and lateral regions), and the anal segment rather prominently beneath with terra-cotta.

The pupa derived from the larva previously mentioned as pupating on 2nd August produced a male imago on 6th September, *i.e.* 35 days later. An example bred by Mr. Clark remained in the pupal state for 21 days. The majority of the butterflies emerged earlier in the season than would have been the case under natural conditions, and all were below the usual average size of the species.

The *imago* (Plate XVIII) does not normally appear in any numbers before October, remaining out until the middle or end of December. It reappears in February and continues up to the beginning of May. A badly worn specimen, however, has been noted as late as 27th May. The insect is very local, but not uncommon where it occurs. It is often found frequenting plants of *Mundia spinosa* DC. (Schilpadbessie) and on one occasion this shrub was used for ovipositing, a single egg being laid, but a larva which was subsequently offered the plant as food refused to feed upon it. The species was discovered by the late Mr. H. L. L. Feltham in the Cape Peninsula, October–February, 1900–1902.

Distribution.—Localities in Cape Town district: Retreat; Rondevlei; Strandfontein; Durbanville; near Milnerton; Melkbosch Strand; near Brakfontein (on road to Mamre).

Further locality: Near Montagu.

The larva of *Phasis felthami* bears a close superficial resemblance to that of *Phasis thysbe* L. (an abundant species in most of the above localities), but may be distinguished from this by the longer bristles on body and round tubercles, the better defined longitudinal lines, the absence of a pair of small white protuberances (composed of minute closely set flower-shaped spines) on first segment, and the different form of some of the markings on the three rear segments. It should be noted, however, that a colour variety of the larva of *thysbe* sometimes occurs in which green replaces the usual brownish-grey hue of the upper surface of the body.

A LIST OF RECENTLY DETERMINED FOOD-PLANTS OF A FEW
SOUTH AFRICAN BUTTERFLIES' LARVAE.

By C. G. C. DICKSON and GOWAN C. CLARK of Port Elizabeth, who
has kindly supplied the names of food-plants (with notes) of all
species marked with an asterisk.

SPECIES OF BUTTERFLIES.

Danaida chrysippus L.

Pseudonympha hyperbius L.

P. vigilans Trim.

Leptoneura mintha Geyer.

Acraea horta L.

Pyrameis cardui L.

* *Precis (Junonia) cebrene* Trim.

* *Cupido lysimon* Hubn.

C. lingeus Cram.

C. thespis L.

Lycaenesthes definita Butl.

* *Deudorix antalus* Hopff.

FOOD-PLANTS AND NOTES.

Stapelia variegata L. (Asclepiadaceae).

Ehrharta (Gramineae): Eggs laid
singly on leaf-blades.

Restio cincinnatus Mast. (Restionaceae):
Eggs laid singly on stems.

Ficinia (Cyperaceae): Butterfly drops
eggs while fluttering in middle of
clump of grass. (Observed by Mr.
P. R. Robertson and myself.)

Asclepias curassavica L. (Garden shrub
introduced from West Indies) (As-
clepiadaceae): Food-plant noted by
Mr. N. S. Pillans, to whom I am also
indebted for the identification of
several other plants.

Arctotis, cultivated (Compositae): Eggs
laid singly on stems and leaves.

Barleria pungens L. (Acanthaceae):
Eggs laid singly, hidden between
leaves of young shoot.

Amaranthus deflexus L. (Amaran-
thaceae).

Tribulus terrestris L. (Zygophyllaceae):
Eggs laid singly under leaf.

Salvia species (Labiatae): Eggs laid
singly on leaves.

Saxifraga species (introduced from
Europe) (Saxifragaceae).

Phylica imberbis Berg. (Rhamnaceae):
Eggs laid singly on flower-heads and
leaves.

Rhus species (Anacardiaceae).

Acacia saligna Wendl. (Port Jackson
willow, introduced) (Leguminosae):
Eggs laid singly on young flower-
heads and leaves.

Schotea speciosa Jacq. (Leguminosae):
Eggs laid singly. Larvae remain in
pod, eating the bean.

SPECIES OF BUTTERFLIES.

Phasis zeuxo L., small dark sub-species.

P. felthami Trim.

P. pyroeis Trim.

P. thysbe L., and var. *osbecki* Aur.

P. thysbe, variety with blue area of male much reduced (principally in forewing) in comparison with that of ordinary form (hind-margins dentate).

P. thysbe, variety resembling *osbecki* but with blue area in forewing of male reduced (hind-margins non-dentate).

P. thero L.

P. wallengrenii Trim.

P. malagrida Wllg.

* *Terias brigitta* Cram.

FOOD-PLANTS AND NOTES.

Osteospermum moniliferum L. (Compositae): Eggs laid singly on underside of leaves (observed on only one occasion).

Zygophyllum sessilifolium L.

Z. flexuosum E. & Z.

Z. morgsana L. (Zygophyllaceae): Eggs laid singly under plant. Larva associated with ants (*Cremastogaster* species).

Zygophyllum species and association of larva with ants as above.

Zygophyllum sessilifolium L.

Z. flexuosum E. & Z.

Z. morgsana L.: Eggs laid singly on younger stems and underside of leaves. Larva associated with ants (*Cremastogaster peringueyi* Emery).

Aspalathus spinosa L. (Leguminosae).

Zygophyllum species as above, also association with ants.

Osteospermum moniliferum L.: Eggs laid singly on stems and leaves.

Melianthus major L. (Melianthaceae): Ascertained by the Rev. D. P. Murray since the publication of his work.

Rhus species. In case of latter food-plant a single egg was seen being deposited in cleft between flower-bearing and leaf stems.

Senecio pubigerus L. (Compositae): Eggs laid in small batches on stems. Spinous scales from butterfly's abdomen adhere to surface of egg.

Ifloga laricifolia Less. (Compositae).

Aspalathus species: Eggs laid singly or in pairs on stems. Numerous scales adhere to surface of egg.

Cassia mimosoides L. (Leguminosae): Eggs laid singly near tip of young frond.

SPECIES OF BUTTERFLIES.

FOOD-PLANTS AND NOTES.

* *Pieris zochalia* Boisd.

Maerua triphylla Thunb. (Capparideae):
Eggs laid singly, generally on upper
side of leaf.

* *P. mesentina* Cram.

Capparis oleoides Burch.
Maerua triphylla Thunb. (Capparideae):
Eggs laid in cluster, generally on
underside of leaf or near terminal
of young shoot.

* *P. gidica* Godt.

Capparis citrifolia Lam.: Eggs laid
singly on leaf of young shoot.

* *P. severina* Cram.

Maerua triphylla Thunb.
Capparis oleoides Burch.
C. zeyheri Turcz.: Eggs laid in cluster,
generally on underside of leaf.

* *Herpaenia eriphia* Godt.

Maerua triphylla Thunb.: Eggs laid
in small clusters on leaf.

* *Teracolus eris* Klug.

Capparis oleoides Burch.: Eggs laid
singly, generally under young leaf.

* *T. omphale* Godt. }
* *T. antigone* Boisd. }

{ *Capparis citrifolia* Lam.
{ *Cadaba juncea* Harv. (Capparideae):
In each case eggs laid singly on
young shoot.

* *Eronia buquetii* Boisd.

Azima tetracantha Lam. (Salvado-
raceae): Eggs laid singly on young
shoot.

Kedestes lenis Riley.

Imperata arundinacea Cyr. var. *thun-
bergii* Hack. (Gramineae): Eggs
laid singly on leaf-blades.

Parnara mohopaani Wllg.

Food-plant and egg-laying as above.
(Observed by Mr. P. R. Robertson.)

A number of the above plants were kindly identified for me at the Bolus
Herbarium, Kirstenbosch, and at the Herbarium of the South African Museum.

EXPLANATION OF PLATES.

PLATE XVIII. *Phasis felthami* Trim.

(Plate of black and white drawings by C. G. C. Dickson.)

Pupa, $\times 3$.

Larva, $\times 3$ (about 80 per cent. full grown).

Imago, $\times 1$, male and female.

Food-plants, *Zygophyllum sessilifolium* L. and *Z. flexuosum* E. & Z. (ant
associated with larva on tip of former).

PLATE XIX. *Phasis felthami* Trim.

(Half-tone reproductions of coloured drawings by Gowan C. Clark.)

Egg, $\times 20$, and section of surface highly magnified.

Larva on emergence, $\times 40$, cross-section of same, and outline of last two segments showing position of tubercles and pair of branched spines.

Lateral view of 7th segment of full-grown larva (from right side).

Stud-shaped spines.

Tubercle (half extended).

Tubercle (fully extended) and position of spiracle.

Dorsal view of last three segments, showing position of honey gland (indicated by arrow) and tubercles.